

Certificate  
AUG 31 2006  
of CorrectionPATENT  
Attorney's Do. No. 8371-093

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

RECEIVED  
CENTRAL FAX CENTER

FEB 10 2005

In re patent application of: Chingwei Chang

Patent No.: 6,765,693 Issued: July 20, 2004

Serial No.: 09/527,887 Filed: March 20, 2000

For: PHOTO QUALITY COLOR PRINTING BY USING LIGHT BLACK  
INK

Confirm. No. 4391

Date: February 10, 2005

## TRANSMITTAL LETTER

Technology Center 2600  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

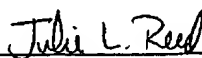
Enclosed for filing in the above-referenced application are the following:

- ☒ Petition from Refusal to Issue Certificate of Correction
- ☒ Exhibits, A (11 pages), B (7 pages), C (5 pages) all marked COPY
- ☒ Any deficiency or overpayment should be charged or credited to deposit  
account number 13-1703.

Customer No. 20575

Respectfully submitted,

MARGER JOHNSON &amp; McCOLLOM, P.C.

  
Julie L. Reed  
Reg. No. 35,349MARGER JOHNSON & McCOLLOM, P.C.  
1030 SW Morrison Street  
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503-222-3613I hereby certify that this correspondence  
is being transmitted to the U.S. Patent and  
Trademark Office via facsimile number  
1-703-872-9306, on February 10, 2005.  
Total Pages: 25Signature  
  
Lauren Ballard-Gemmell

AUG 31 2006

PATENT NO. 6,765,693  
Attorney's Doc. No. 8371-093

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

**RECEIVED**  
**CENTRAL FAX CENTER**

FEB 10 2005

In re Patent No.: 6,765,693  
Inventor: Chang  
Issued: Jul. 20, 2004

For: PHOTO QUALITY COLOR PRINTING BY USING LIGHT BLACK INK

Ser. No.: 09/527,887  
Group Art Unit: 2622

Filed: Mar. 20, 2000  
Examiner: Timothy J. Stephany

**Petition from Refusal to Issue Certificate of Correction Under MPEP 1002.02(c)**

Director  
Technology Center 2600  
USPTO  
Alexandria, VA

**BY FAX**

Under 37 CFR 1.181 and MPEP 1002.02(c), Applicant hereby submits this Petition to overcome a refusal by the Decisions and Corrections Branch to issue a Certificate of Correction in the above-captioned patent.

History

This patent issued from an application filed March 20, 2000. The original text of this application is included with this petition as Exhibit A. In the Detailed Description of the Preferred Embodiments starting on page 6 of this originally filed application, there were paragraphs beginning on the following page and line numbers that have been numbered for ease of reference herein:

Page 6, line number 2; (1)  
Page 6, line number 17; (2)  
Page 6, line number 21; (3)  
Page 7, line number 4; (4)  
Page 7, line number 8; (5)  
Page 7, line number 11; (6)  
Page 7, line number 19; (7)  
Page 8, line number 1; (8)  
Page 8, line number 8; (9)  
Page 8, line number 12; (10)  
Page 8, line number 18; (11)  
Page 8, line number 22; (12)

AUG 31 2006

Page 9, line number 5; (13)  
Page 9, line number 13; (14)  
Page 9, line number 20; (15)

In response to an office action mailed January 15, 2004, included here as Exhibit B, Applicant had made amendments to the specification by replacement paragraphs for three paragraphs: paragraphs 1, 4 and 10 as numbered above. See the attached Exhibit B, page 3. It must be noted that the amendment to the specification was for the *paragraphs* at the appropriate line and page number, not *the text beginning*.

In the issued patent, the text for unamended paragraphs 2, 3, which lay between paragraphs 1 and 4, and the text for unamended paragraphs 5-9, which lay between paragraphs 4 and 10, was deleted. It is unclear why this text was deleted, it seems the amendment was misread and the text was deleted between the amended paragraphs by mistake. The missing paragraphs 2 and 3 should be in the issued patent at column 3, line 17, and the missing paragraphs 5-9 should be in the issued patent at column 3, line 27.

Applicant filed a Request for Certificate of Correction, included here as Exhibit C, which was refused on the grounds that 'the alleged error in column 3, line 17 & 27, is printed in accordance with the record.' However, it is clear from the above, and the attached documents that the patent was not printed in accordance with the record.

#### Petition

Therefore, Applicant requests that the refusal to issue a Certificate of Correction be overturned and that the Request for Certificate of Correction be granted.

Respectfully submitted,  
MARGER JOHNSON & McCOLLOM, P.C.

Julie L. Reed  
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I hereby certify that this correspondence  
is being transmitted to the U.S. Patent and  
Trademark Office via facsimile number  
(703) 872-9306 on February 10, 2005.

Signature

Lauren Ballard-Gemmell

Name: Lauren Ballard-Gemmell

AUG 31 2006

**EXHIBIT A****PHOTO QUALITY COLOR PRINTING BY USING LIGHT BLACK****BACKGROUND OF THE INVENTION**5 1. Field of the Invention

This invention relates to color printing, more particularly to producing high quality printed images using light black ink.

2. Background of the Invention

Color printing typically uses cyan, magenta, yellow and black (CMYK) inks  
10 or toners to produce full-color printed images. The term ink is defined to include  
toners, inks and any other color delivering solution in a printer system. Printed  
images are formed from dots of these colors in a combination determined by the  
desired color to be printed. However, at lower resolution such as 600 dots per  
inch (dpi), the black dots become very noticeable. The resulting images appear  
15 grainy, especially when the black ink used inkjet pigment black ink. This  
particular ink is a different material than the dye-based CMY inks used.

Several different solutions to this problem have been proposed. Two  
common approaches are to print using CMY with no K or to modulate the black  
generation such that when there is high luminance there is less black. In the first  
20 of these approaches, the necessary amounts of black are achieved by layering  
the CMY dots. These methods have been in use for a long time.

There are several examples of lesser-used procedures. However, they  
encompass two main ideas. The first is to control the density of the dots of ink in  
a given region of the printed image. The second controls the color of the ink or  
25 inks used.

**EXHIBIT A**

Examples of the first approach can be found in US Patents Nos. 4,713,746 ('746); 4,930,018 ('018); 5,386,305 ('305); and 5,648,801 ('801). In the '746 patent, for example, the picture elements or pixels are restricted to be under 70% of the total area of the picture. This reduces the roughness of the image. A similar technique is used in the '305 patent by classifying areas as intermediate and high density and controlling the amount of black in that area.

Other approaches, such as that found in the '018 patent, the gray scale ink drop count and associated dye loading of the ink are tightly controlled to maximize the uniform distribution of the ink on the printed media.

Yet another approach, found in the '801 patent, scans the incoming image several times. This produces several bit maps that are then handled as if they were part of a multicolor image. The image is then printed with a print head for each optical density bitmap, thereby controlling the densities of the print dots.

The second type of approach controls the ink concentration or density itself. Examples can be found in US Patent Nos. 4,860,026 ('026); 5,767,876 ('876); 5,142,374 ('374); 5,795,082 ('082); 5,734,800 ('800); and 5,805,178 ('178). For example, the '026 patent uses two different concentrations of ink. Each pixel of the printed image is made up of several dots. The dots could be from the high concentration ink, the low concentration ink, or a combination of both. A similar technique is used in the '876 patent.

In another approach found in the '374 patent the generated data for dark ink is converted into a binary signal and used to reproduce the resolution. The generated data for the light ink is converted into a separate signal, used to

**EXHIBIT A**

reproduce gradient. These two signals and the control of the discharge of both inks is used to record the image. A similar method is used with regards to a dark ink looked up from a table in the '082 patent.

Some techniques use what is referred to as six-color printing. The technique of the '800 patent uses two inks of cyan, two of magenta, yellow and one black, often referred to in short-hand version as CC'MM'YK. One technique uses six-color printing with at least of the three inks having a fluorescent response. The use of the fluorescent response of the inks the image is smoothed out to avoid graininess.

10 In the '178 patent, the range of pixel intensities are divided into three bands. Cyan and magenta are halftoned, with four levels per pixel. In the darkest band, the darker ink is always present and the lighter is halftoned. In the intermediate band is halftoned between the light ink and the darker ink. The light bank uses only halftoned light ink. However, it must be noted that only light inks  
15 are used for the colors of CMY. There are no examples in the art of using light ink for black.

Both types of solutions have problems. The methods that modulate the generation of black dots in the image regions use dark ink and cannot remove the noticeable black dots. The methods using two ink concentrations do not use  
20 light black. The methods that avoid the use of black, using a combination of C M and Y to generate black, but degrades the color gamut.

No solution exists that suggests the use of only one black ink, where that black ink is light ink.

**EXHIBIT A****SUMMARY OF THE INVENTION**

One aspect of the invention is using light black ink to render color images in a printing system. The use of light black ink requires a different method to produce black generation values. The method uses two thresholds, where the value of the thresholds depends upon the density of the light black ink used. The first threshold is approximately where the cyan, magenta and yellow inks will begin to combine with black ink to produce black in the printed image. The second threshold is the point on a gray component density curve where the absolute value of black ink becomes a constant. The method determines a black generation value using these thresholds. Once the black generation value is determined, the other color values are adjusted to account for the black generation value.

**EXHIBIT A****BRIEF DESCRIPTION OF THE DRAWINGS**

For a more complete understanding of the present invention and for further advantages thereof, reference is now made to the following Detailed Description taken in conjunction with the accompanying Drawings in which:

5        Figure 1 shows a prior art black generation curve for printed images.

Figure 2 shows a black generation curve for printed images, in accordance with the invention.

Figure 3 shows a flow chart for a method of printing with light black ink, in accordance with the invention.



**EXHIBIT A****DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Color printers use a technique referred to a black generation to produce values for the cyan-magenta-yellow-black (CMYK) inks for any given gray level. Note that the term ink is used to include inks and toners. For example, if black

5 generation is at 100%, the following values would result:

C:	50	M:	25	Y:	10, prior to removal;
C:	40	M:	15	Y:	0 K: 10.

For black generation at 50%, the following values would result:

10

C:	50	M:	25	Y:	10, prior to removal;
C:	45	M:	20	Y:	5 K: 5.

In this manner, black is set equal to a percentage of the lowest CMY value, that value is reduced to by the black value, and that amount is subtracted from the remaining colors.

In the above 100% example, black was set to 100% of the lowest value, 10. The value 10 was then subtracted from the remaining colors, in this case C and M. For the 50% example, black was set to 50% of the lowest value, or 5, and 5 was subtracted from the remaining values, including the minimum value Y.

This can be expressed as follows, where N is equal to the minimum value of CMY.

$N = \text{Min}(C, M, Y);$        $K = k\_generate\_table(N);$

$C = C - c\_table(K);$        $M = M - m\_table(K);$

25  $Y = Y - y\_table(K).$

~~The term k\_generate\_table is a table used to adjust the undercolor removal~~  
percentage. This avoids decreasing luminance when black ink takes place of

**EXHIBIT A**

CMY inks, and optimizes the reproduction color gamut. The values  $c_{table}$ ,  $m_{table}$  and  $y_{table}$  adjust the amount of color ink to preserve the correct color chromaticity.

An example of black generation table values,  $k_{generate\_table}$  from the  
5 equations above, is shown by curve 10 in Figure 1. As can be seen, the black generation value is essentially zero for lower gray component values. Gray component value is

As the gray component density increases, black is generated at a very low percentage. At the maximum gray component density, black is generated at  
10 100%. Black generation at 100% was given as an example above.

Use of lighter black ink allows a different black generation table to be used. One example of black generation values in accordance with the invention is shown by curve 20 in Figure 2. Once the gray component density reaches a value near the maximum black ink density, the CMY dots are used for higher  
15 levels of gray component density as shown by curve 22. Once the maximum black ink density is reached in the gray component curve, the black component becomes a constant at whatever value of black ink intensity that particular ink has.

For example, if a black ink of  $1/3$  the intensity of standard black inks is  
20 used, the maximum value of black is 33%. For gray component densities higher than values around 33%, the black component will be a constant. At some point, the CMY dots will be used to generate black in addition to the light black ink.

**EXHIBIT A**

In the example using 1/3 intensity ink, the curve 22 has two thresholds. The first threshold occurs at the point where the CMY dots begin to be used to generate black tones. In Figure 2, this value is at 25% gray component density. The second threshold is the point at which black becomes a constant. In Figure 2, this value is at 35% gray component density. In between these two points, a smooth curve links them. These values are for this example only. Different intensities of ink will result in different thresholds.

A flowchart for a general method of this invention is shown in Figure 3. At step 30, the gray component value or density is determined. This is probably a known value at this point in the printing process, as the processor needs this information prior to rendering the image.

At step 34, the black generation value is determined. If the gray component density is below a first threshold, the black generation will be at 100%. As discussed above, black generation at 100% sets the black value equal to the minimum CMY value. If the gray component density is above a second threshold, the absolute value of black becomes a constant and the black generation process adjusts the other colors accordingly.

In this process, the ability to add any black beyond the highest density of black no longer exists. Therefore, the values of the other colors must be adjusted to provide enough layering of the colors to achieve the proper gray component density for black regions of the image.

After the black generation value is determined, the other colors are rendered. For a four-color process (CMYK), the new values for the other colors

**EXHIBIT A**

are adjusted for the value of black generation in step 34. If a six-color process is used, or other process where there are more than one density of the other color inks, the use of these other densities can be optimized for use with light black ink.

5 For example, using the values from the above discussion, assume the colors cyan and magenta have full intensity inks and 1/3 intensity, or light, inks. The process can be referred to as CC'MM'YK', where the (') make designates a 1/3 intensity ink. In this example, only light cyan or magenta dots would be used when the gray component density is lower than the first threshold of 25%. High  
10 intensity dots would be added after 25%. At 33.33% gray component density, the light color dots would become solid. After the calculations are performed, the processor knows how much of which color at which intensity that pixel requires.

As mentioned previously, no other printing approach uses light black ink. There are several approaches that use light and dark inks for the colors, such as  
15 CC'MM'YK. Methods that use dark black ink only produce images where the dark black dots are noticeable at lower levels of gray component density, detracting from image quality. This approach does not suffer from the noticeable black dots.

Thus, although there has been described to this point a particular  
20 embodiment for a method for printing color images using light black ink, it is not intended that such specific references be considered as limitations upon the scope of this invention except in-so-far as set forth in the following claims.

**EXHIBIT A****WHAT IS CLAIMED IS:**

1. A method for printing images using light black ink, comprising the steps of:
  - a) setting a first and second threshold, wherein the first and second thresholds are determined by an intensity value of the light black ink relative to standard black ink;
  - b) determining a gray component density value for a pixel;
  - c) calculating a black generation value, wherein the black generation value is at one hundred percent if the gray component density is below the first threshold and the absolute value of black is a constant if the gray component density is above the second threshold;
  - d) generating values for other colors dependent upon the black generation value.
2. The method of claim 1 wherein the intensity value of the light black ink is  $1/3$  intensity of standard ink.
3. The method of claim 1 wherein the first threshold is twenty five percent.
4. The method of claim 1 wherein the second threshold is thirty five percent.
5. The method of claim 1 wherein the other colors comprise cyan, magenta and yellow.
6. The method of claim 1 wherein the other colors comprise cyan, light cyan, magenta, light magenta and yellow.

**EXHIBIT A****ABSTRACT**

A method for printing images using light black ink. The method sets a first and second threshold determined by an intensity value of the light black ink relative to standard black ink. The method then determines a gray component density value for a pixel, calculates a black generation value based upon the first and second thresholds and then generates values for other colors dependent upon the black generation value.

## EXHIBIT B

PATENT APPLICATION  
Do. No. 8371-093

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Chingwei Chang

Confirmation No.: 4391

Serial No.: 09/527,887 Examiner: Timothy J. Stephany

Filed: March 20, 2000 Group Art Unit: 2622

For: PHOTO QUALITY COLOR PRINTING BY USING  
LIGHT BLACK INK

Date: March 23, 2004

Mail Stop NON -FEE AMENDMENT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Responsive to the Office Action dated January 15, 2004, enclosed is an amendment in the above-identified application. The fee has been calculated as shown below.

CLAIMS AS AMENDED					
For:	Number After Amendment	Previous Number	Extra	Rate	Additional Fee
Total Claims	6	6*		x \$18 =	\$-0-
Independent Claims	1	1**		x \$86 =	\$-0-
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT					\$-0-

\*greater of twenty (20) or number for which fee has been paid

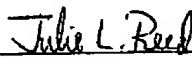
\*\*greater of three (3) or number for which fee has been paid

☒ Any deficiency or overpayment should be charged or credited to deposit account number 13-1703.

Customer No. 20575

Respectfully submitted,

MARGER JOHNSON &amp; McCOLLOM, P.C.

  
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Reg. No. 35, 349MARGER JOHNSON & McCOLLOM, P.C.  
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I hereby certify that this correspondence is being transmitted to the U.S. Patent and Trademark Office via facsimile number (703) 872-9306 on March 23, 2004.

Signature

Name: Janet Sullivan

**EXHIBIT B**

**PATENT APPLICATION**  
**Do. No. 8371-093**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**In re application of:** Chingwei Chang

**Confirmation No.:** 4391

**Serial No.:** 09/527,887

**Examiner:** Timothy J. Stephany

**Filed:** March 20, 2000

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**For:** PHOTO QUALITY COLOR PRINTING BY USING  
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**Date:** March 23, 2004

**Mail Stop NON-FEE AMENDMENT**  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, VA 22313-1450**

**AMENDMENT**

Responsive to the Office Action, Paper No. 6, dated January 15, 2004, please amend the application as follows.

**Amendments to the Specification** begin on page 2 of this paper.

**Amendments to the Claims** begin on page 3 of this paper.

**Remarks/Arguments** begin on page 4 of this paper.

**An Appendix** including amended drawing figures is attached following page 5 of this paper.

**EXHIBIT B-2**



**EXHIBIT B****Amendments to the Specification**

**Please replace the paragraph on page 6, line 2 with the following:**

“Color printers use a technique referred to as black generation to produce values for the cyan-magenta-yellow-black (CMYK) inks for any given gray level. Note that the term ink is used to include inks and toners. For example, if black generation were at 100%, or maximum black, the following values would result:

C: 50 M: 25 Y: 10, prior to removal;

C: 40 M: 15 Y: 0 K: 10.

For black generation at a 50% level, the following values would result:

C: 50 M: 25 Y: 10, prior to removal;

C: 45 M: 20 Y: 5 K: 5.

In this manner, black is set equal to a percentage of the lowest CMY value, that value is reduced to by the black value, and that amount is subtracted from the remaining colors.”

**Please replace the paragraph on page 7, line 4, with the following:**

“An example of black generation table values, k\_generate\_table from the equations above, is shown by curve 10 in Figure 1. As can be seen, the black generation value is essentially zero for lower gray component values. Gray component density is the current gray level expressed as a percentage of the highest gray level attainable. The actual percentage is the gray component density value. For example, a gray component density may have a range of 0 to 255. A gray component value of 50% would be equivalent to 128.”

**Please replace the paragraph on page 8, line 12, with the following:**

“At step ~~34~~ 32, the black generation value is determined. If the gray component density is below a first threshold, the black generation will be at 100%. As discussed above, black generation at 100% sets the black value equal to the minimum CMY value. If the gray component density is above a second threshold, the absolute value of black becomes a constant and the black generation process adjusts the other colors accordingly.”

**EXHIBIT B-3**

**EXHIBIT B****Amendments to the Claims**

1. (currently amended) A method for printing images using light black ink, comprising the steps of:
  - a) setting a first and second threshold, wherein the first and second thresholds are determined by an intensity value of the light black ink relative to standard black ink;
  - b) determining a gray component density value for a pixel;
  - c) calculating a black generation value, wherein the black generation value is at one hundred percent if the gray component density is below the first threshold and the absolute value of black is a constant if the gray component density is above the second threshold;
  - d) generating values for other colors dependent upon the black generation value.
2. (original) The method of claim 1 wherein the intensity value of the light black ink is 1/3 intensity of standard ink.
3. (original) The method of claim 1 wherein the first threshold is twenty five percent.
4. (original) The method of claim 1 wherein the second threshold is thirty five percent.
5. (original) The method of claim 1 wherein the other colors comprise cyan, magenta and yellow.
6. (original) The method of claim 1 wherein the other colors comprise cyan, light cyan, magenta, light magenta and yellow.

**EXHIBIT B-4**

**EXHIBIT B****REMARKS**

Claims 1-6 are pending in the application. The Examiner has rejected claims 1-6 and has objected to the specification and the drawings.

The Examiner has objected to the specification for informalities. All of the informalities, except one, are corrected by the amendments to the specification above. There was one informality that did not require correction, but clarification. The numbers on page 6, lines 6-7 and 11-12 are not percentages, nor are they intended to be percentages. The percentage refers to the percentage of black generation. This has been clarified by other amendments to that paragraph, as well as a completion of the gray component density value definition. It is submitted that the amendments to the specification overcome the objections and withdrawal of those objection is requested.

The drawings have been corrected to overcome the Examiner's objection of the lack of a tag of PRIOR ART on Figure 1.

Claim 1 was rejected under 35 USC § 112, first paragraph, as failing to comply with the enablement requirement. Claims 2-6, which are dependent on claim 1, are rejected for the same reason. There was a typographical error on page 7, line 7, in which the definition of gray component density value was not completed. This definition has been provided as well as a clarification that the gray component density value and the gray component value previously referred to are the same term. This definition does not constitute new matter, as it is discussed in accordance with this invention on pages 6 and 7.

It is submitted that the amendment to specification to provide this information overcomes the rejection and withdrawal of this rejection is requested.

The prior art referred to but not relied upon have been reviewed and are not considered pertinent to the Applicant's invention. Kakutani, Slade, Motta, Huang and Warner refer to methods of mixing diluted and non-diluted inks. Applicant's invention as

**EXHIBIT B 5**

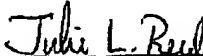
**EXHIBIT B**

using inks of all colors that are 1/3 the concentration to increase the gradation characteristics. However, Iwasaki does not address black generation in any manner, much less the black generation as claimed in Applicant's invention.

No new matter has been added by this amendment. Allowance of all claims is requested. The Examiner is encouraged to telephone the undersigned at (503) 222-3613 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

MARGER JOHNSON & McCOLLOM, P.C.

  
\_\_\_\_\_  
Julie L. Reed  
Reg. No. 35,349

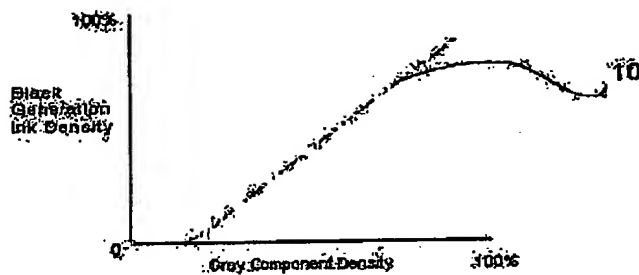
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Portland, OR 97205  
(503) 222-3613  
Customer No. 20575

**EXHIBIT B-6**

Inventor: Chingwei Chang  
Title: F...FO QUALITY ENHANCING BY USING L...F BLACK INK  
Attorney Docket No. 8371-093/Application No. 09/527,887

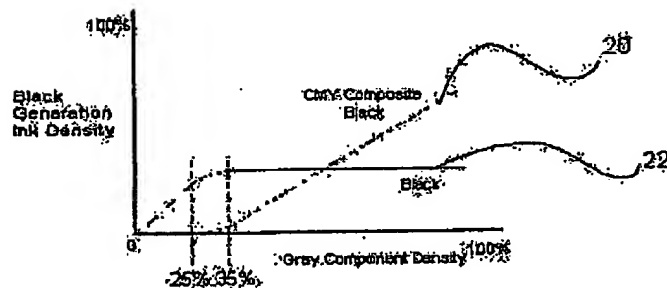
## REPLACEMENT SHEET

1/2



### Figure 1

## PRIOR ART



## Figure 2

**EXHIBIT B-7**

## EXHIBIT C

PATENT APPLICATION  
Attorney's Doc. No. 8371-093

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent No.: 6,765,693  
Inventor: Chang  
Issued: Jul. 20, 2004

For: PHOTO QUALITY COLOR PRINTING BY USING LIGHT BLACK INK

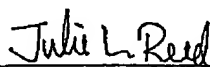
Ser. No.: 09/527,887  
Group Art Unit: 2622Filed: Mar. 20, 2000  
Examiner: Timothy J. Stephany

## TRANSMITTAL LETTER

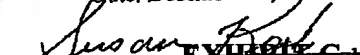
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MARGER JOHNSON & McCOLLOM, P.C.  
Julie L. Reed  
Reg. No. 35,349~~MARGER JOHNSON & McCOLLOM, P.C.~~  
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Portland, OR 97205  
503-222-3613  
Customer No. 20575I hereby certify that this correspondence  
is being deposited with the United States  
Postal Service as first class mail in an  
envelope addressed to: Commissioner for  
Patents, P.O. Box 1450, Alexandria, VA  
22313-1450

Date: December 22, 2004

  
EXHIBIT C  
Susan Kari

## EXHIBIT C

PATENT NO. 6,765,693  
Attorney's Doc. No. 8371-093

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent No.: 6,765,693  
Inventor: Chang  
Issued: Jul. 20, 2004

For: PHOTO QUALITY COLOR PRINTING BY USING LIGHT BLACK INK

Ser. No.: 09/527,887  
Group Art Unit: 2622

Filed: Mar. 20, 2000  
Examiner: Timothy J. Stephany

## REQUEST FOR CERTIFICATE OF CORRECTION

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Upon comparison of the above-identified original Letters Patent with applicant's copy of the application therefor, the following errors in the original Letters Patent have been noted:

Column 3, line 17, insert the following paragraphs --¶ In the above 100% example, black was set to 100% of the lowest value, 10. The value 10 was then subtracted from the remaining colors, in this case C and M. For the 50% example, black was set to 50% of the lowest value, or 5, and 5 was subtracted from the remaining values, including the minimum value Y. ¶ This can be expressed as follows, where N is equal to the minimum value of CMY.

$$\begin{aligned} N &= \text{Min}(C, M, Y); & K &= k\_generate\_table(N); \\ C &= C - ctable(K); & M &= M - mtable(K); \\ Y &= Y - ytable(K). \end{aligned}$$

The term  $k\_generate\_table$  is a table used to adjust the undercolor removal percentage. This avoids decreasing luminance when black ink takes place of CMY inks, and optimizes the reproduction color gamut. The values  $ctable$ ,  $mtable$ , and  $ytable$  adjust the amount of color ink to preserve the correct color chromaticity.--.

Column 3, line 27, insert the following paragraphs --¶ As the gray component density increases, black is generated at a very low percentage. At the maximum gray component density, black is generated at 100%. Black generation at 100% was given as an example above. ¶ Use of lighter black ink allows a different black generation table to be used. One example of black generation values in accordance with the invention is shown by curve 20 in Figure 2. Once the gray component density reaches a value near the maximum black ink density, the CMY dots are used for higher levels of gray component density as shown by curve 22. Once the maximum black ink

EXHIBIT C-2

## EXHIBIT C

*Request for Certificate of Correction*  
*Patent No. 6,765,693*  
*Page two*

density is reached in the gray component curve, the black component becomes a constant at whatever value of black ink intensity that particular ink has. ¶ For example, if a black ink of 1/3 the intensity of standard black inks is used, the maximum value of black is 33%. For gray component densities higher than values around 33%, the black component will be a constant. At some point, the CMY dots will be used to generate black in addition to the light black ink. ¶ In the example using 1/3 intensity ink, the curve 22 has two thresholds. The first threshold occurs at the point where the CMY dots begin to be used to generate black tones. In Figure 2, this value is at 25% gray component density. The second threshold is the point at which black becomes a constant. In Figure 2, this value is at 35% gray component density. In between these two points, a smooth curve links them. These values are for this example only. Different intensities of ink will result in different thresholds. ¶ A flowchart for a general method of this invention is shown in Figure 3. At step 30, the gray component value or density is determined. This is probably a known value at this point in the printing process, as the processor needs this information prior to rendering the image.--.

Applicant respectfully requests that a Certificate of Correction calling attention to the above errors be issued pursuant to Rule 322 of the Patent Office and Title 35, United States Code, Section 254. Two copies of a Certificate of Correction form are enclosed.

Respectfully submitted,  
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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Date: December 22, 2004

Susan Kral  
Susan Kral

EXHIBIT C-3



## EXHIBIT C

PTO/SB/44 (02-01)

Approved for use through 01/31/2004. OMB 0651-0033

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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UNITED STATES PATENT AND TRADEMARK OFFICE  
CERTIFICATE OF CORRECTION

PATENT NO : 6,765,693  
DATED : Jul. 20, 2004  
INVENTOR(S) : Chang

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 3, line 17, insert the following paragraphs --¶ In the above 100% example, black was set to 100% of the lowest value, 10. The value 10 was then subtracted from the remaining colors, in this case C and M. For the 50% example, black was set to 50% of the lowest value, or 5, and 5 was subtracted from the remaining values, including the minimum value Y.¶ This can be expressed as follows, where N is equal to the minimum value of CMY.

$$\begin{aligned} N &= \text{Min}(C, M, Y); & K &= k\_generate\_table(N); \\ C &= C - ctable(K); & M &= M - mtable(K); \\ Y &= Y - ytable(K). \end{aligned}$$

The term `k_generate_table` is a table used to adjust the undercolor removal percentage. This avoids decreasing luminance when black ink takes place of CMY inks, and optimizes the reproduction color gamut. The values `ctable`, `mtable`, and `ytable` adjust the amount of color ink to preserve the correct color chromaticity.--.

Column 3, line 27, insert the following paragraphs --¶ As the gray component density increases, black is generated at a very low percentage. At the maximum gray component density, black is generated at 100%. Black generation at 100% was given as an example above.¶ Use of lighter black ink allows a different black generation table to be used. One example of black generation values in accordance with the invention is shown by curve 20 in Figure 2. Once the gray component density reaches a value near the maximum black ink density, the CMY dots are used for higher levels of gray component density as show by curve 22. Once the maximum black ink density is reached in the gray component curve, the black component becomes a constant at whatever value of black ink intensity that particular ink has.¶ For example, if a black ink of 1/3 the intensity of standard black inks is used, the maximum value of black is 33%. For gray component

EXHIBIT C-4

AUG 31 2006

## EXHIBIT C

## Certificate of Correction

Patent No. 6,765,693

Page two

densities higher than values around 33%, the black component will be a constant. At some point, the CMY dots will be used to generate black in addition to the light black ink.¶ In the example using 1/3 intensity ink, the curve 22 has two thresholds. The first threshold occurs at the point where the CMY dots begin to be used to generate black tones. In Figure 2, this value is at 25% gray component density. The second threshold is the point at which black becomes a constant. In Figure 2, this value is at 35% gray component density. In between these two points, a smooth curve links them. These values are for this example only. Different intensities of ink will result in different thresholds.¶ A flowchart for a general method of this invention is shown in Figure 3. At step 30, the gray component value or density is determined. This is probably a known value at this point in the printing process, as the processor needs this information prior to rendering the image.--.

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EXHIBIT C-5

AUG 31 2006